Application No. 10/009,627
Applicant: Isamu UEMASU et al
Amendment dated January 22, 2004
Reply to Office Action of September 22, 2003

CONDITIONAL PETITION FOR EXTENSION OF TIME

If entry and consideration of the amendments above requires an extension of time, Applicants respectfully request that this be considered a petition therefor. The Assistant Commissioner is authorized to charge any fee(s) due in this connection to Deposit Account No. 14-1263.

ADDITIONAL FEE

Please charge any insufficiency of fees, or credit any excess, to Deposit Account No. 14-1263.

REMARKS/ARGUMENTS

Applicants respectfully request reconsideration and allowance of this application in view of the amendments above and the following comments.

Claims 3-5 and 8 were rejected under 35 U.S. C. §112, second paragraph, as being indefinite. In response, Applicants have amended claim 8 to change the phrase "hardly permeable to oil droplets of the two or more organic phases" to the phrase -- substantially impermeable to oil droplets of the two or more organic phases --. Even if the phrase "substantially impermeable" does not appear *ipsis verbis* in the original specification, its use does not constitute new matter inasmuch as persons skilled in the art would understand from the teaching that the diaphragm is "hardly permeable to oil droplets of two or more organic phrases," that the diaphragm is "substantially impermeable" to such oil droplets. Accordingly, the concept of a diaphragm being substantially impermeable to such oil droplets is, in fact, conveyed to persons skilled in the art by the original specification as filed. Consequently, the use of the phrase "substantially impermeable" does not introduce new matter. *See, e.g., In re Anderson,*

176 USPQ 331, 336 (CCPA 1973), for the proposition that in determining whether an amendment to a claim constitutes new matter, the question is not whether the added *word* is a word that is used in the application as filed, but whether the *concept* embodied by the added word is present in the original specification.

Moreover, as pointed out in MPEP § 2173.05(b), the term "substantially" is ***"often*** used in conjunction with another term to describe a particular characteristic of the claimed invention," albeit "is a broad term." Indeed, a search of the United States patents issued since 1976 reveals some approximately 758,000 patents having claims reciting the term "substantially"! It should be clear, therefore, that persons skilled in the art understand the metes and bounds of the term "substantially," and, consequently, its use here should be permitted.

In view of the foregoing, Applicants respectfully request that the Examiner reconsider and withdraw this rejection. An early notice that this rejection has been reconsidered and withdrawn is earnestly solicited.

Claims 3-5 and 8 were rejected under 35 USC § 103(a) as being obvious over Uemasu et al. ("Uemasu"), U.S. Patent No. 5,095,173, in view of Armstrong et al. ("Armstrong"), *Anal. Chem., 59:* 2237-2241 (1987). In response, Applicants respectfully request that the Examiner reconsider and withdraw this rejection as well.

First of all, Applicants would like to point out that U.S. Patent No. "5,177,302" recited in the third line on page 4 of the Office Action is in disagreement with U.S. Patent No. "5,095,173" recited on page 3 and in the "Notice of References Cited" page of the Office Action. Since the column and line numbers on page 4 of the Office Action do not seem to be those in U.S. Patent No. 5,095,173, the Examiner may have looked through U.S. Patent No. 5,177,302 not cited in the Office Action. In that event, Applicants respectfully request that, if this rejection is maintained,

the Examiner issue a new Office Action citing U.S. Patent No. 5,177,302, and not make that new Office Action final.

The Examiner has recognized that Uemasu differ from Applicant's invention in that Uemasu do not disclose the use of a diaphragm or membrane in the separation process. Another difference should also be noted: Uemasu separately stir or shake the organic phase of isomers with an aqueous solution of substituted cyclodextrin, and extract isomers with a volatile organic solvent (col. 3, lines 10-39 in U.S. Patent No. 5,177,302), whereas these manipulations are conducted simultaneously in Applicant's invention (present invention) to continuously effect inclusion complexation and extraction. In order to simultaneously do them, use is made of a diaphragm permeable to the aqueous solution of inclusion-complexing agent but substantially impermeable to oil droplets of the organic phases in the present invention.

Armstrong discloses that membrane mediate separations can be used in continuous processes (pages 2237, 2nd col., 2nd par.), but, when so used, they exhibit the fatal disadvantages of lacking the selectivity and efficiency of chromatographic systems (page 2237, 2nd col., the last line through page 2238, 1st col., line 2). In view of selectivity, liquid membranes employing mobile carriers (cyclodextrin) are used (pages 2238, 1st col., line 2-4). Herein, liquid membranes are utterly different from the diaphragm in the present invention. As stated in the information disclosure statement, Armstrong discloses two types of chambers that were used to form liquid membranes. The first type consisted of two identical glass chambers sealed together against an O-ring and a paper support as shown in Figure 1A on page 2238, 2nd col. The paper support was impregnated with a cyclodextrin solution by dipping filter paper in the cyclodextrin solution to form a very thin liquid membrane (page 2238, 2nd col., lines 3-5). The second type consisted of a capillary tube without the use of filter paper as shown in Figure 1B on page 2238, 2nd col. The very thin liquid membrane is believed to be formed by surface tension of an aqueous cyclodextrin

solution, and is formed of the aqueous cyclodextrin solution alone. This teaches that filter paper in the first type is not a membrane by itself, but plays only the role of a support for reinforcing the liquid membrane of the aqueous cyclodextrin solution. Thus, oil droplets of the organic phrases are not formed in the cyclodextrin solution because the liquid membrane reinforced with filter paper has not sufficient liquid space to allow oil droplet formation.

By contrast, oil droplets of the organic phases are positively formed in the aqueous phase of cyclodextrin solution by stirring at least neighborhoods of the respective liquid-liquid interfaces according to the method of the present invention. When the organic phase of raw material is dissolved into the organic phase of extraction solvent via the aqueous phase, selective separation is not effected as a matter of course (page 4, the last line through page 5, line 2 in the instant specification). In view of the above, the diaphragm is used for securing separation for the two kinds of organic phases. Further, use of the diaphragm improves the contact efficiencies because the organic phase of raw material and the organic phase of extraction solvent can be vigorously stirred together with the aqueous cyclodextrin solution, whereby the rates and efficiencies of inclusion complexation and dissociation-extraction can be enhanced (page 5, lines 16-21 in the instant specification). As asserted by the Examiner, Armstrong discloses that the cyclodextrin inclusion complex of an isomer formed at the aqueous-organic interface is diffused across the membrane and the isomer is released at the opposite interface (page 2238, 2nd col., "Results and Discussion," lines 5-10). However, the isomer is diffused only via the surfaces of the aqueous liquid membrane. By contrast, formation of oil droplets in the present invention can make the areas of aqueous-organic interfaces very large to improve the rates and efficiencies of inclusion complexation and dissociation-extraction.

Thus, it will be easily understandable that a diaphragm in the present invention is utterly different in function, purpose of use and the way of use from filter paper in Armstrong. The

Examiner has asserted that use of a known member of a class of materials in a process is not patentable if other members of the class were known to be useful for that purpose, even though results are better than expected. Even if this stated a correct statement of the law—which Applicants do not concede—the principle has no bearing here because the liquid membrane in Armstrong does not correspond to the diaphragm disposed in the aqueous phase of an aqueous solution of inclusion-complexing agent but to that aqueous phase in the present invention, and because Armstrong lack an idea of providing, or disposing, a diaphragm in said aqueous phase.

The contact areas of the organic phases with the aqueous phase in Armstrong are limited to those of the surfaces of a piece of an aqueous liquid membrane to make the separation efficiency poor and unsuitable to large scale industrial separations. The liquid membrane in the first type of Armstrong is formed of an aqueous cyclodextrin solution infiltrated into filter paper, and is never considered usable in large scale industrial separations from the viewpoint of strength, durability, etc. of the liquid membrane. The liquid membrane in the second type of Armstrong has no support and hence is inapplicable to large scale industrial separations.

By contrast, the present invention relates to an industrially operable separation method. In the present invention, filter paper in some Examples is not used as a support, but as a partitioning diaphragm disposed in the aqueous phase. The diaphragm is provided, or disposed, in the middle of the aqueous phase existing between the two or more organic phases to prevent oil droplets of the organic phase of raw material dispersed in the aqueous phase from migrating to the organic phase of extraction solvent and to prevent oil droplets of the organic phase of extraction solvent from migrating to the organic phase of raw material.

Use of a tough diaphragm suitable for large scale industrial separations enables vigorous stirring to be effected to disperse efficiently oil droplets of the organic phases (raw material and extraction solvent) in the aqueous phase, whereby the contact areas of the aqueous-organic

interfaces are made very large to remarkably improve the contact efficiency. Comparison of Example 2 with Example 1 in the instant specification demonstrates that vigorous stirring while disposing a diaphragm in the aqueous phase enables selective and efficient separation to be effected even for a shorter stirring time (2 hours in Example 1 and 1 hour in Example 2). Additionally stated, according to additional experiments, when separation of p-xylene and m-xylene was done under substantially the same conditions as in Example 1 except that the stirring time was varied every 20 minutes within the range of 20 to 100 minutes, the proportion of p-xylene extracted into n-heptane phase was substantially constant around 82 %.

There is absolutely nothing in the prior Uemasu reference or in its combination with Armstrong that teaches or suggests these results. Accordingly, the data in the specification should be considered to be surprising and unexpected, and, therefore, as objective evidence of nonobviousness. Although these data are not in declaration form, consistent with the rule that *all* evidence of nonobviousness must be considered when assessing patentability, the Examiner must consider data in the specification in determining whether the claimed invention provides unexpected results. *In re Soni,* 34 USPQ2d 1684, 1687 (Fed. Cir. 1995).

Lastly, Applicants comment on the reference (7) cited in Armstrong, i.e., Lonsdale, *H.K. J. Membr. Sci., 10:* 81-181 (1982), on the basis of which the Examiner has asserted that Armstrong discloses that membrane based separations can be used in continuous processes (page 2237, 2nd col., 2nd para.). This reference seems to disclose only that "in cross-flow filtration, feed solution is continuously passed tangentially across the surface of the membrane, in much the same way as in reverse osmosis (RO) or UF" on page 94, 1st para. Thus, this reference fails to disclose a continuous inclusion compelxation and dissociation-extraction mechanism in the present invention, and deals with membrane filtration capable of only simple separation.

In view of the foregoing, Applicants submit that the Examiner would be fully justified to reconsider and withdraw this rejection as well. An early notice that this rejection has been reconsidered and withdrawn is, thus, also earnestly solicited.

Early and favorable action is earnestly solicited.

Respectfully submitted,
NORRIS MCLAUGHLIN & MARCUS, P.A.

By _____
Kurt G. Briscoe
Reg. No. 33,141

220 East 42nd Street - 30th Floor
New York, New York 10017
Phone: (212) 808-0700
Fax: (212) 808-0700

CERTIFICATE OF FACSIMILE TRANSMISSION

I hereby certify that the foregoing Amendment and attachments (11 pages total) are being facsimile transmitted to the United States Patent and Trademark Office on the date indicated below:

Date: January 22, 2004

By _____
Kurt G. Briscoe